



Dolphinfish in the Western Atlantic—an Ecosystem Based Case Study

Kristin Kleisner (presenter)
University of Miami, RSMAS

Josh Sladek Nowlis
NOAA Fisheries Southeast Fisheries Science Center

Abstract

Dolphinfish (*Coryphaena hippurus*) are the basis of an important fishery in the western central Atlantic (the wider Caribbean basin). This fishery presents management challenges in that information about the population is uncertain and management needs span across national and international jurisdictions. Dolphinfish are believed to be highly migratory, seasonally abundant, and to exhibit more complex stock structure than larger oceanic epipelagic species, such as tunas and billfishes. Most of the information about dolphinfish in this region comes from studies in waters of the United States and the eastern Caribbean, yet there is a general paucity of information on which to base species-specific management. No Caribbean government undertakes regular assessments of dolphinfish or has put in place any species-specific management program.

The goal of this project is to identify and explore the implications of broad oceanographic and topographic features that may affect dolphinfish population dynamics. These findings in turn would be helpful in advising management needs for this species. We will pursue this goal by collecting and standardizing catch, landings, and abundance data for dolphinfish from the wider Caribbean basin and analyzing these data against physical and broad scale biological features. Fisheries dependent data will come from a variety of both commercial and recreational sources including US observer longline data (1992-present), the fishery logbook system, the accumulated landings system, carcass weight data, the Trip Interview Program (TIP), the Marine Recreational Fishing Statistical Survey (MRFSS), the For-Hire Survey, and the NOAA fisheries Southeast Headboat Survey (all primarily collected from US-based fleets). Fishery independent data is also available from an NSF sponsored larval billfish cruise. This project is using MOCNESS tows to collect larval trophodynamic data for billfish and other pelagic larvae, including dolphinfish, in the Florida Straits. In addition to the larval samples, CTD data is collected at most sites (temperature, currents, and salinity at various depths to the ocean bottom) as well as chlorophyll data. Dolphinfish are abundant in these samples, and it will be interesting to examine the competition/predator/prey relationship in the larval life history as a comparison to the adult and juvenile stages.



Kleisner and Nowlis, continued

Both fishery-dependent and fishery-independent data will be examined for correlations to corresponding geographic and temporal oceanographic and topographic information. Previous studies of long-term data (1962-1989) in Barbados indicated that such correlations may be important in shaping the timing of the dolphinfish season and possibly recruitment (Mahon, 1990). Oceanographic information that would be needed would include sea surface temperature (SST), currents, upwelling regions, and monthly probabilities of front occurrence. Topographic information includes regional bathymetry and bottom habitat types. With these information sources organized into a GIS framework, we will have the capacity to identify and explore the implications of spatially-explicit broad-scale for dolphinfish and the fisheries this species supports.

Dolphinfish in the Western Atlantic—an Ecosystem Based Case Study

Kristin Kleisner
University of Miami—RSMAS

Josh Sladek Nowlis
NOAA/SEFSC

September 9, 2004

Purpose of Research

- Compile abundance estimates for dolphinfish in the Gulf of Mexico and wider Caribbean.
- Study dolphinfish as a part of a Caribbean-wide collaboration
 - Use catch and landings data from western Atlantic.
 - Commercial, Recreational, Headboat
- Standardize and examine data in GIS-based framework.
- Emphasize the potential for using widespread geographic information that is remotely sampled to evaluate stock dynamics and movements

Study Area—Wider Caribbean



Why Dolphinfish?

- Fast growing, short-lived, migratory, pelagic fish
 - May be capable of sustaining higher fishing pressures.
- Wide variety of data available and interesting ecological applications
 - Extensive spatial data
 - Ecological interactions with other target species.
- **Given the migratory, shared nature of the dolphinfish resource, a regional approach to assessment and management should be required.**
 - GIS—link fishery dependent information and environmental information.

Sources of Fishery-Dependent Data—Commercial

- U.S. Pelagic Longline Observer Data
 - Record fish species, length, weight, sex, location, and other environmental information
 - Evaluate the harvest and status of the pelagic fish stocks
 - Evaluating the effectiveness of management measures to control harvest levels.
- Finest scale for GIS work.

Sources of Fishery-Dependent Data—Commercial

➤ **FLS (Fisheries Logbook System)**

- Federally issued logbook requires all fishermen to submit written report of fishing activity for specific federally managed species.
- Dolphinfinch is caught as bycatch of targeted tuna and swordfish.

➤ **PLL (Pelagic Long Line)**

- If vessel was actively fishing for swordfish, then logbook form must be submitted for each set that vessel made.
- This system is currently being incorporated into FLS.

Sources of Fishery-Dependent Data—Commercial

➤ **ALS (Accumulated Landings System)**

- Developed by NMFS and state fishery agencies in Southeast in early 1980s.
- Cooperative program for the collection and processing of commercial fisheries statistics (exception of two counties, one in Mississippi and one in Alabama).
- Canvas statistics collected by the fishery agency in respective state and provided to SEFSC as part of a Cooperative Statistics Program (CSP).

Sources of Fishery-Dependent Data—Commercial

➤ **DLS (Domestic Longline System)/ Dealer Weighout**

- Contains size-frequency data from dealers and vessel captains who submit individual carcass weight information from weigh-out sheets.



Sources of Fishery-Dependent Data—Commercial

➤ TIP (Trip Interview Program)

- Collect size frequency data representative of the species subject to stock assessments.
- Catch-per-unit effort for individual trips that are sampled.

Trip Interview Report

YEAR	1993												
Count of Sum (Days Fished)	MONTH_NAME												
VESSEL_NAME	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Grand Total
2ND DESTINY	1											1	2
2ND WIND	1							1			1	1	4
786 BENGAL I			1										1
ADELAIDE				1									1
ADVENTUROUS												1	1
AILEEN II	1								1			1	3
ALEX						1					1		2
ALEX JAMES					1								1
ALEXIS M	1								1			1	3
ALLANA KAY	1								1		1	1	4
ALMOST	1												1
AMY MARIE						1							1
AMY MICHELLE	1	1	1	1	1	1	1	1	1	1			10
ANGLER	1	1	1		1			1	1				6

Sources of Fishery-Dependent Data—Recreational

➤ MRFSS (Marine Recreational Fishing Statistical Survey)

- NMFS surveys since 1979—standardized, comparable estimates of participation, effort and catch by recreational anglers U.S. waters—except Texas.
- Numbers/size distributions of fish species caught in each mode and area within each state or subregion.
 - Telephone survey of households in coastal counties.
 - Interview survey of anglers at fishing access sites.

➤ Better for Private Boats and Shore Fishing, than Charter or Headboat Operations.



Sources of Fishery-Dependent Data—Recreational

➤ For-Hire Survey (Extension of MRFSS)—Since June 2003

- Fishing "effort data"
 - Numbers of trips and passengers taken in a given week.
 - Weekly telephone sampling of for-hire captains.
- "Catch data"
 - In-person interviews with for-hire patrons at dockside access-points.
- "Validation data"
 - Dockside observations to correct reporting errors.

➤ Better statistically for Charter and Headboat Operators.



Sources of Fishery-Dependent Data—Recreational

➤ NOAA Fisheries Southeast Headboat Survey (SEHS)

- Data from 1986 to present.
- Monitor fishing on party/headboats.
- SEHS is a mandatory logbook survey.
 - Dockside biological sampling to obtain weight/length data and samples for aging analyses.



Desired Information From Fishery Dependent Data

- Catch
- Catch Rates (Relative Index of Abundance)
 - Logbooks, Observer Data
 - TIP??
- Size
 - From TIP, Recreational Surveys, Observer Data, Carcass weight data

Sources of Fishery-Independent Data—Larval Billfish Cruise

- MOCNESS tows
- Collect larval trophodynamic data for dolphinfish, in the Florida Straits.
- Environmental data collected at most sites:
 - CTD
 - Temperature,
 - Currents
 - Salinity
 - Chlorophyll data.

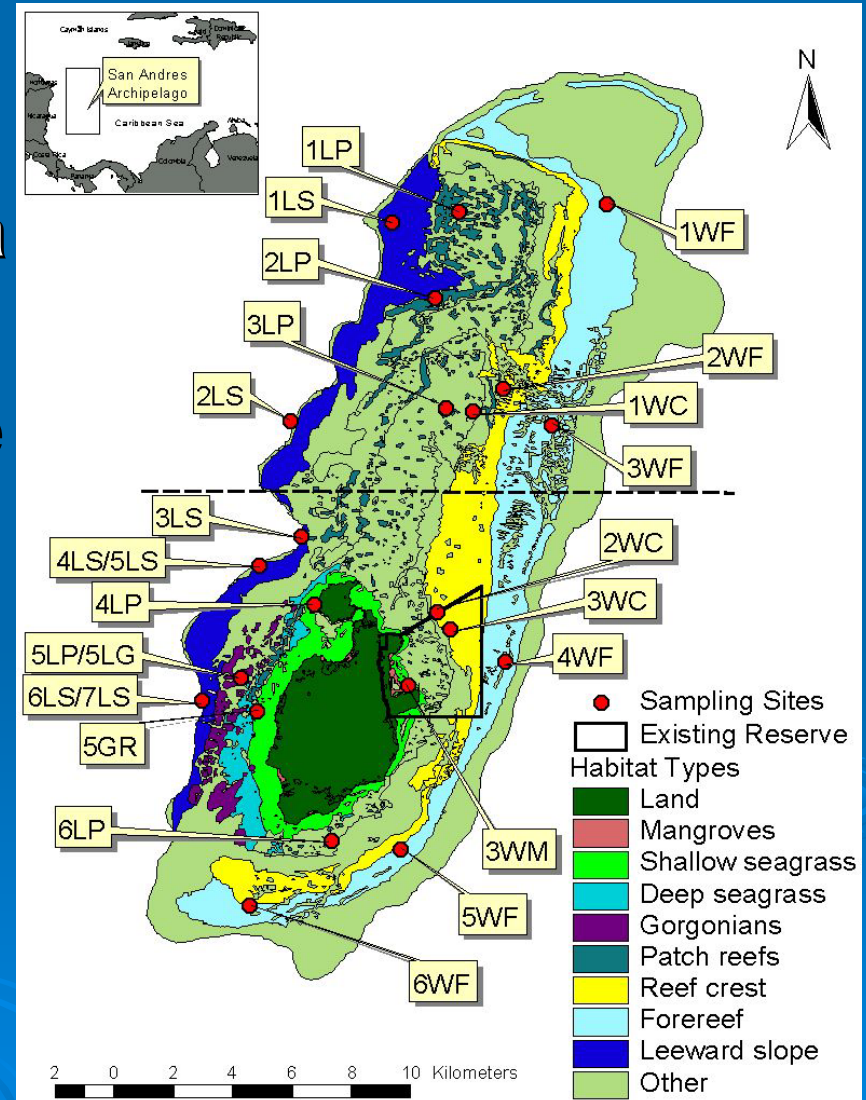


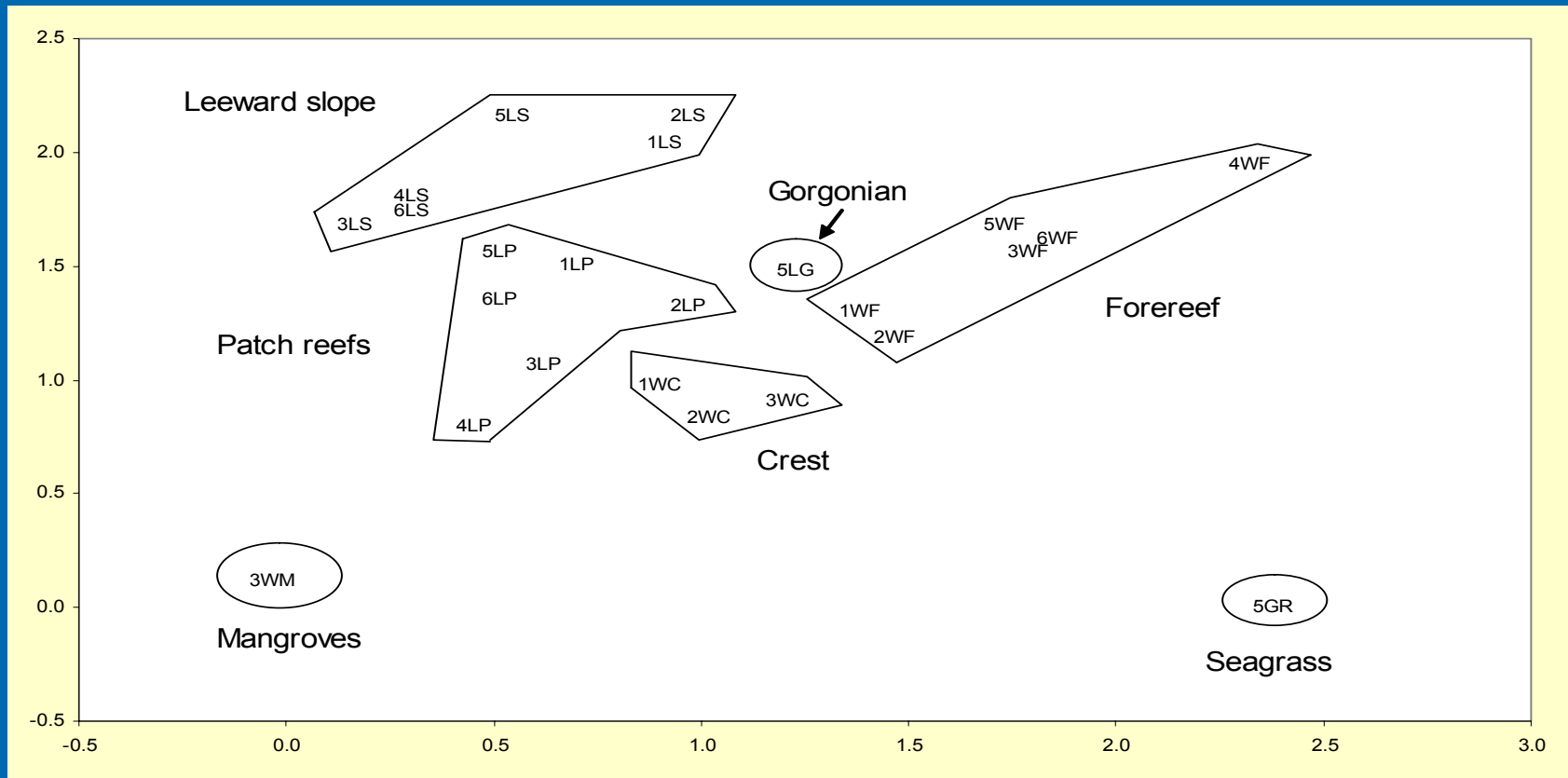
An Example

- Ways to use GIS to make most of limited data
- Process:
 - Set goals
 - Inventory data
 - Selectively collect limited new data
 - Analyses
 - Advice

Friedlander et al. 2003

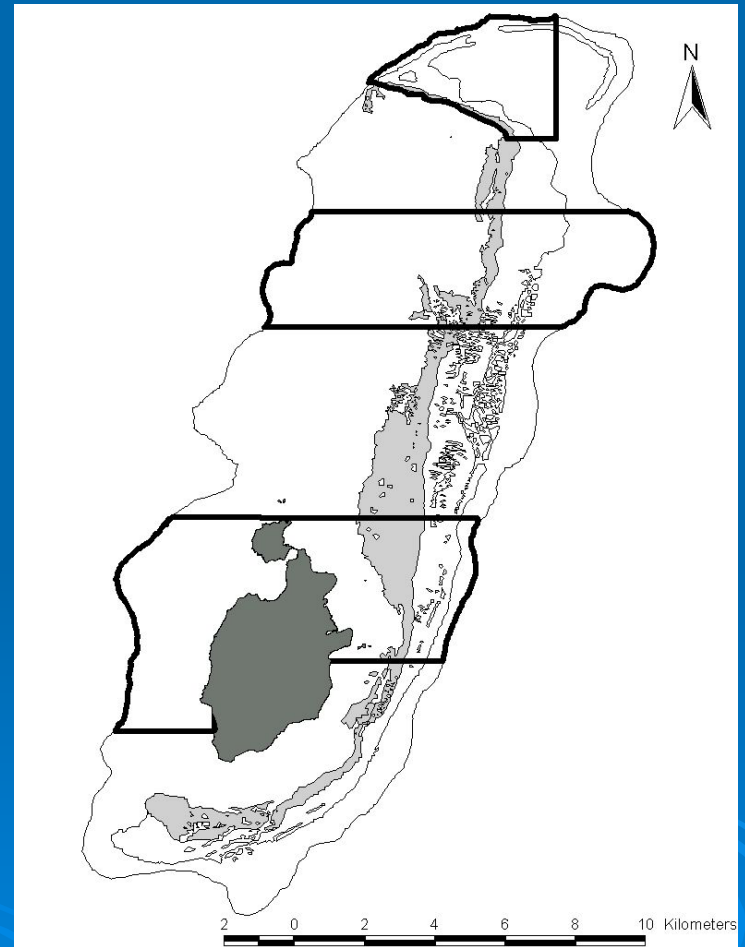
- Had habitat maps for Providence Is, Colombia
- Habitat types redefined w/ecological knowledge
- Fish and benthos sampled in each habitat
- Data analyzed to look for correlations with habitat types





- Benthic community properties (not shown) and fish assemblages (shown) consistent within habitat type definitions—can conclude that habitat types were ecologically relevant and thus a basis for scaling up sampled data

Opinion vs. Advice

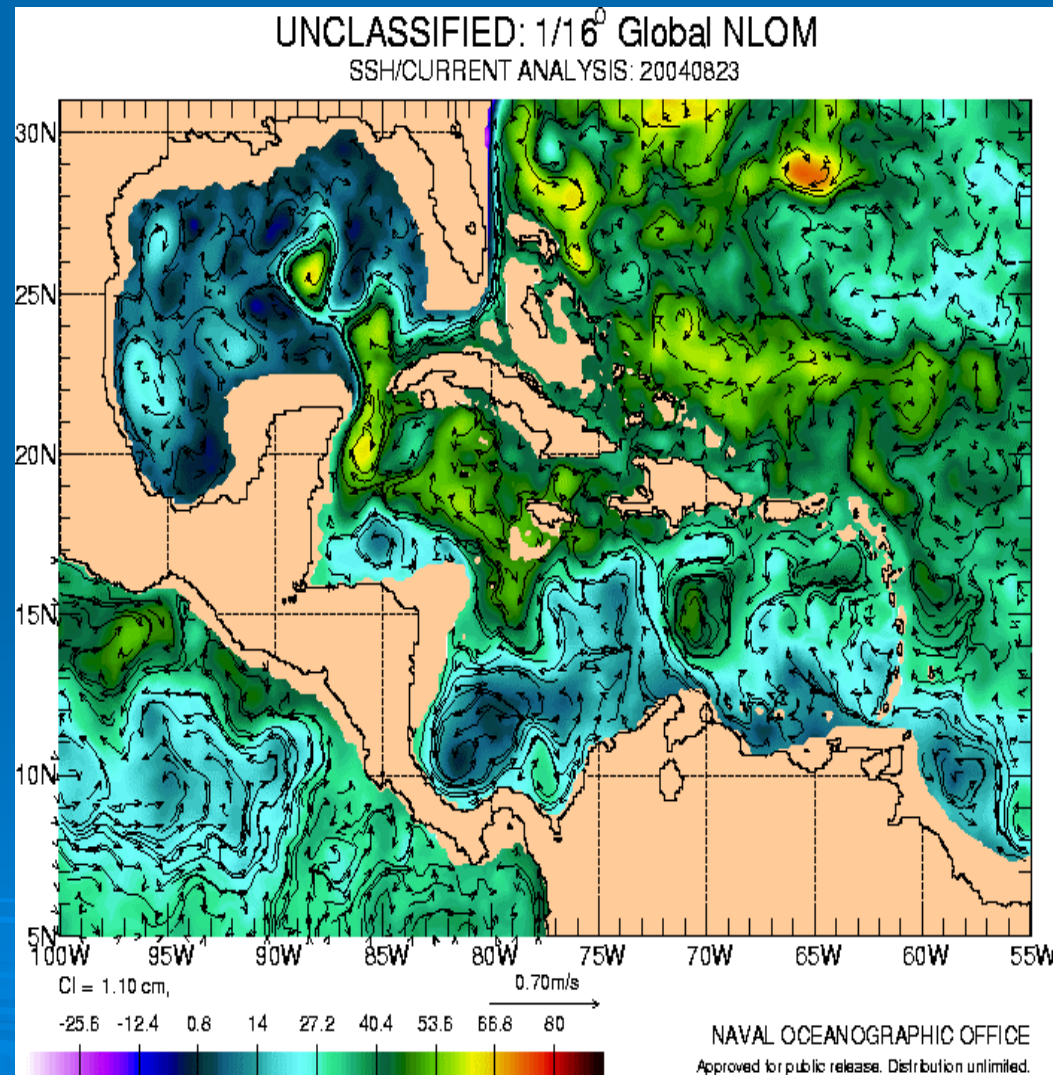


Conclusions

- Habitat types, when defined well, were good surrogate for species distributions, and ecological processes?
- Broad scale data can be utilized with strategic sampling of important issues when the broad scale data has strong ecological relevance
- Don't present "optimal" solution since that will depend on values of interest

GIS Data Needs?

- Bathymetry
- Bottom Habitats
- SST (Sea Surface Temperature)
- Currents
- Upwelling
- Salinities
- Designated EFH Boundaries
- Spatial Distribution of fishing effort
- Monthly Front Occurrence

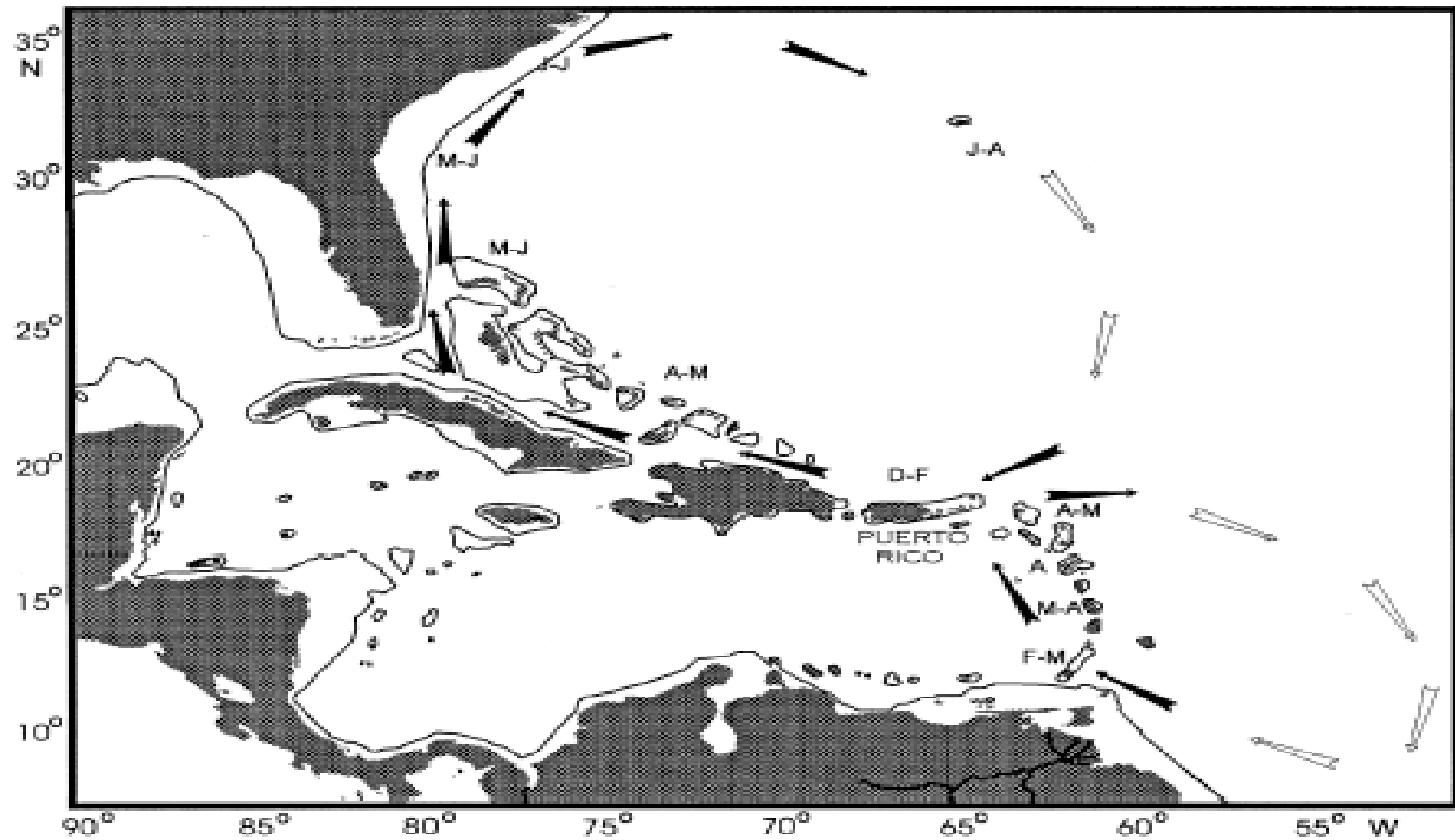


“Weeds From Space??”

- Dr. Edward J. Kearns, University of Miami, RSMAS
 - Working on the detection and quantification of sargassum weed mats in the western North Atlantic Ocean using high-resolution MODIS imagery.



Are There Two Stocks?—Proposed Migration Circuit for Separate Stocks



Are There Two Stocks?

- Differences in mean size of individuals in the catch and seasonality of catches at 14 locations between Grenada and Cape Hatteras, (Oxenford and Hunte, 1986).
- Electrophoretic studies showed some significant differences between dolphin from Barbados and from Florida.
 - Significant difference in allele frequencies of the 2 populations at IDH-2 locus in heart extracts, and in phenotypic frequencies at IDH-2,3 loci in liver extracts

Questions??



© Seapics.com